

Student Name:

Student id:

Sect #: Serial #:

University of Bahrain

College of Information Technology
Department of Computer Science

ITCS332: Organization of Programming Languages

Quiz#2: Chapter 3_Syntax

QUESTION 1: Construct the BNF rules to define the **DECL** statement. A **DECL** statement is one of the keywords: *int*, *float*, *double*, *char*, followed by one or more identifiers (names) separated by commas and terminated by a semicolon. An **id** is defined as a letter followed by zero or more digits/letters. Assume **digit** and a **letter** is already defined. {5 pts}

```
<DECL> → <TYPE> <ids> ";"  
<ids> → <id> | <ids> "," <id>  
<TYPE> → "int" | "float" | "double" | "char"  
<id> → <letter> | <id> <letter> | <id> <digit>
```

QUESTION 2: Given the following grammar:

{6 pts}

- 1) <print> → "print" << <exps> "\$"
- 2) <exps> → <exp> | <exp> ":" <exps>
- 3) <exp> → <const> | <id>

a) Convert the BNF rules #2 and #3 ONLY into ONE EBNF rule.

```
<exps> → (<const>|<id>)* { ":" (<const>|<id>)* }
```

b) Construct the right-most derivation of a sentence: **print** << <id> : <const> : <id> \$

```
<print> => "print" << <exps> "$"  
=> "print" << <exp> ":" <exps> "$"  
=> "print" << <exp> ":" <exp> ":" <exps> "$"  
=> "print" << <exp> ":" <exp> ":" <exp> "$"  
=> "print" << <exp> ":" <exp> ":" <id> "$"  
=> "print" << <exp> ":" <const> ":" <id> "$"  
=> "print" << <id> ":" <const> ":" <id> "$"
```

ITCS332: Organization of Programming Languages

Quiz#2: Chapter 3_Syntax

QUESTION 1: Construct the BNF rules to describe a real value. A real value `<real>` is a sequence of a **sign** (+ or -) followed by an **integer** part `<int>` (sequence of one or more digits) followed by **dot** followed by a **fractional** part `<frac>` (sequence of one or more digits). Plus sign is optional for positive values.

Assume a digit is already defined: `<dig>` → "0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9".

Examples of accepted real values: +20.34567, -7.6, 307.80, -0.2.

{5 pts}

```

<real>  → <sign> <int> "." <frac> | <int> "." <frac>
<frac>  → <dig> | <frac> <dig>
<int>   → <dig> | <int> <dig>
<sign>  → "+" | "-"

```

QUESTION 2: Given the following grammar:

{6 pts}

- 1) `<read>` → `read >> <ids> "#"`
- 2) `<ids>` → `<id> | <id> "!" <ids>`
- 3) `<id>` → `<let> | <id> <let> | <id> <dig>`
- 4) `<let>` → `"A"|"B"|"C"|"..."|"Z"|"a"|"b"|"c"|"..."|"z"`
- 5) `<dig>` → `"0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9"`

a) Convert the BNF rules #2 and #3 ONLY into ONE EBNF rule.

```
<ids> → <let> { (<let>|<dig> ) } { "!" <let> { (<let>|<dig> ) } }
```

b) Construct the right-most derivation of a sentence: `read >> c8 ! A3Z #`

```

<read>  => "read" << <ids> "#
=> "read" << <id> "!" <ids> "#
=> "read" << <id> "!" <id> "#
=> "read" << <id> "!" <id> <let> "#
=> "read" << <id> "!" <id> Z "#
=> "read" << <id> "!" <id> <dig> Z "#
=> "read" << <id> "!" <id> 3 Z "#
=> "read" << <id> "!" <let> 3 Z "#
=> "read" << <id> "!" A 3 Z "#
=> "read" << <id> <dig> "!" A 3 Z "#
=> "read" << <id> 8 "!" A 3 Z "#
=> "read" << <let> 8 "!" A 3 Z "#
=> "read" << c 8 "!" A 3 Z "#

```